

**Under Pressure and in Hot Water – Hydrothermal Reactions of  
Biomass and Biomolecules**

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**Seminar on October 18, 2016 at 11:00 am in 2004 Black**  
**Seminar host: Xianglan Bai**

**Abstract**

There is much interest in using renewable biomass resources to meet demand for fuels and chemicals. Algal biomass is an attractive renewable feedstock because it requires less land area and has a higher photosynthetic efficiency than terrestrial biomass and it does not involve a food/feed vs. fuel competition as does corn ethanol or soy biodiesel. Being aquatic plants, harvested microalgae carry with them tremendous amount of water. Conventional algal bioenergy processes (e.g., lipid extraction for biodiesel production) first remove the water and then process the dried biomass. This drying step is costly and energy intensive. Thus, there is a need for wet biomass conversion processes that operate in the aqueous phase. We are helping to develop the chemical kinetics and reaction engineering foundations for hydrothermal processes that can convert wet biomass into biofuel intermediates directly (no drying) and thereby reduce process energy demands for biofuel production. This talk will outline recent progress made in understanding and optimizing the use of hydrothermal liquefaction for converting wet biomass into liquid fuels. Advancements in molecular characterization of the reaction products, understanding the hydrothermal reaction pathways and kinetics for biomass and model biomolecules, and reaction modeling will be highlighted.

**Phillip E. Savage** is the Head of the Chemical Engineering Department at Penn State and the Walter L. Robb Family Chair. Phil is also Arthur F. Thurnau Professor Emeritus at the University of Michigan. Phil is a Fellow of both the AIChE and ACS and Editor-in-Chief of I&EC Research. He is past-chair of the Industrial & Engineering Chemistry Division of ACS and a past-chair of the AIChE Catalysis and Reaction Engineering Division. Phil's professional service also includes membership on NRC committees dealing with treatment of stockpile munitions and chemical agents and being an expert reviewer for the U.S. EPA Report to Congress entitled "Biofuels and the Environment: First Triennial Report to Congress". Phil has published over 200 research articles in archival journals and given nearly 100 invited lectures at other universities and international symposia. He holds three U.S. patents, two of which have been licensed and put into practice commercially. Phil's research deals broadly with reaction kinetics, pathways, and mechanisms and his recent work focuses on hydrothermal conversion of biomass to fuels. Phil has mentored 43 PhD students, nine of whom have been NSF and/or EPA STAR graduate fellows. He received the inaugural (2015) Energy & Fuels Excellence in Publication Award from ACS, the 2014 Research Excellence Award from the AIChE Sustainable Engineering Forum, the Inaugural (2009) Michigan Governor's Award for Green Chemistry, and the 2001 National Catalyst Award from the American Chemistry Council in recognition of his outstanding teaching and contributions to chemical education.

***This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.***

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